that they are filled with processes from the follicular epithelium, and that the egg is nourished in this manner. In the ova I examined I could not see any processes, but they have been noticed by other observers in larger eggs of fishes, as well as of reptiles and mammals.

IV. *The Follicular Layer.*

The follicular layer in the mature ovum consists usually of a layer of closely-set cells, which, seen from above, have an hexagonal appearance. A peculiar modification of the follicular cells is found in the shanny's egg (*Blennius pholis*). On one-half of the egg's surface the cells are elongated, their depth gradually increasing towards a central point. In this way the depth of the cells varies from 0·007 mm. to 0·032 mm. I never noticed follicular cells passing through the zona radiata, as has been described by many authors.

V. *Development.*

No observation was made as to the origin of the egg, and it could not be determined whether the ovum originated from a simple transformation of an epithelial cell, or whether several unite, as in "elasmobranchs." I am inclined to the belief, however, that Brock's and Kolessnikow's views are correct, according to whom only one cell is concerned in the formation of the primitive egg. In small ova the follicular epithelium is composed of a few large cells. There are several possible ways in which the follicular layer might have originated, either by an aggregation of epithelial cells round the ovum, as in elasmobranchs, or by a collection of connective tissue cells at the periphery of the ovum, or from the nucleus, as in many invertebrates. I have not been able to come to any definite conclusion on this subject.

The egg membranes appear after the follicle. The zona radiata is formed first, and, as well as the zonoid layer, it takes its origin from the yolk.

V. "Note on a New Form of Direct Vision Spectroscope." By G. D. Liveing, M.A., F.R.S., Professor of Chemistry, and J. Dewar, M.A., F.R.S., Jacksonian Professor of Natural Philosophy, University of Cambridge. Received November 18, 1886.

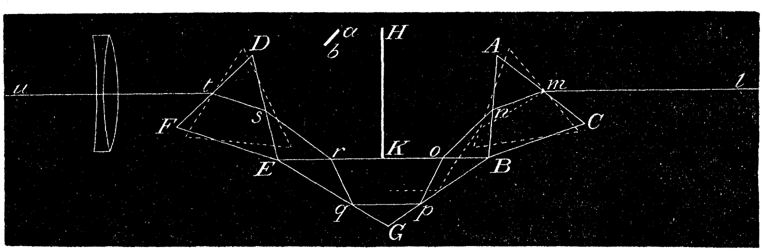
Direct vision spectroscopes are very useful in the observation of shifting objects, such as auroræ and other meteors. They are generally in request for telescopic work, and also in all cases where rapidity of observation is of consequence. Ordinary direct vision

spectroscopes with compound prisms have the disadvantage that the dispersion of the red end of the spectrum is small; less in proportion to that of the blue end than in spectroscopes with simple prisms. Also no measurements of lines can be made with them, except by means of a scale fixed in the field of view, which it is often difficult to see for want of illumination.

Some time since ('Roy. Soc. Proc.,' vol. 28, p. 482) we brought under the notice of the Society a direct vision spectroscope on Thollon's plan, which had not the faults of the instruments with compound prisms. It gave a dispersion equal to that of two prisms of 60°, and excellent definition, but the number of reflecting and refracting surfaces which had to be truly wrought was rather large, and the movement of the prisms by a screw made measurements with it slow.

Since then we have tried a spectroscope with one of the Astronomer Royal's half prisms, but we found it impossible to get good definition with the half prism for more than a small part of the visible spectrum; and in consequence faint bands near either end of the spectrum were quite invisible with this instrument.

The arrangement we have now to describe was intended to obviate the defects of the others.



It has three prisms symmetrically arranged, the middle one serving both for refraction and reflexion. The course of a ray through the prisms is indicated in the annexed diagram. A ray *lm* in the line of the axis of the collimator meets the first prism ABC in *m*, is refracted at *m* and *n*, meets the second prism EGB at *o*, and is then refracted, undergoes two internal reflexions at *p* and *q*, and is refracted out at *r*; it is then refracted through the third prism DEF at *s* and *t*, and emerges in the direction *tu*, which is a prolongation of its original direction *lm* and coincides with the axis of the observing telescope. The prism EGB is fixed, the other two prisms are movable about axes parallel to their edges passing through the points *m* and *t*. They are rotated simultaneously in opposite directions by a pair

of linked levers, of which one carries a graduated arc of $9\frac{1}{2}$ inches radius, by which the angle of rotation can be determined. Those rays which suffer no deviation in passing through the train, must all follow a course through the fixed prism parallel to *opqr*, whatever their refrangibility; but the angle of incidence at *o* will be different for the different values of the refractive index. By turning the two movable prisms into the positions shown by dotted lines the angle of incidence at *o* will be diminished, and a less refrangible ray will follow the course of no deviation. If then the first position of the prisms ABC, DFE, be that for which an extreme violet ray incident in the line *lm* suffers no deviation, all the less refrangible rays incident in the same direction may be successively brought to suffer no deviation by turning the prisms towards the position shown by the dotted line. The angles of the prisms have, of course, to be adjusted so that the extreme violet ray may suffer no deviation. A simple calculation suffices for this when the refractive indices of the glass employed are known. We have had the fixed prism constructed with the acute angles about $33\frac{1}{4}°$, and the movable prisms with angles about 62°. With these angles, when the movable prisms are so placed that the angles of incidence at *m* and of emergence at *o* are equal (the position of minimum deviation), the ray which suffers no deviation is one somewhat more refrangible than K of the solar spectrum. When then the prisms are turned, less refrangible rays are successively brought into the field of view, but no ray much more refrangible than K can be brought into the field. By increasing the acute angles of the fixed prism, or by diminishing the angles of the movable prisms, a longer range can be given to the instrument, but at the expense of some dispersion.

To prevent light passing directly from the collimator to the observing telescope, a stop HK is placed midway between the movable prisms.

It will be observed that the fixed prism serves both as a reflector and refractor, the dispersion produced by it being the same as that of a simple refracting prism of 46° (or 186°−4EBG) in the position of minimum deviation. The dispersion for the extreme violet is therefore that of two prisms of 62° and one of 46° in the position of minimum deviation. For less refrangible rays the position of the movable prisms is not that of minimum deviation and the dispersion is proportionally increased, so as to help, in a small degree, to correct the inequality of dispersion of the two ends of the spectrum. At the same time the symmetry of the arrangement is maintained for all rays when in mid-field, and sharp definition is secured for all parts of the spectrum. This is a most important character. We find that with our instrument A and H of the solar spectrum are equally well seen, and so are the red and violet lines of the flame spectrum of potassium.

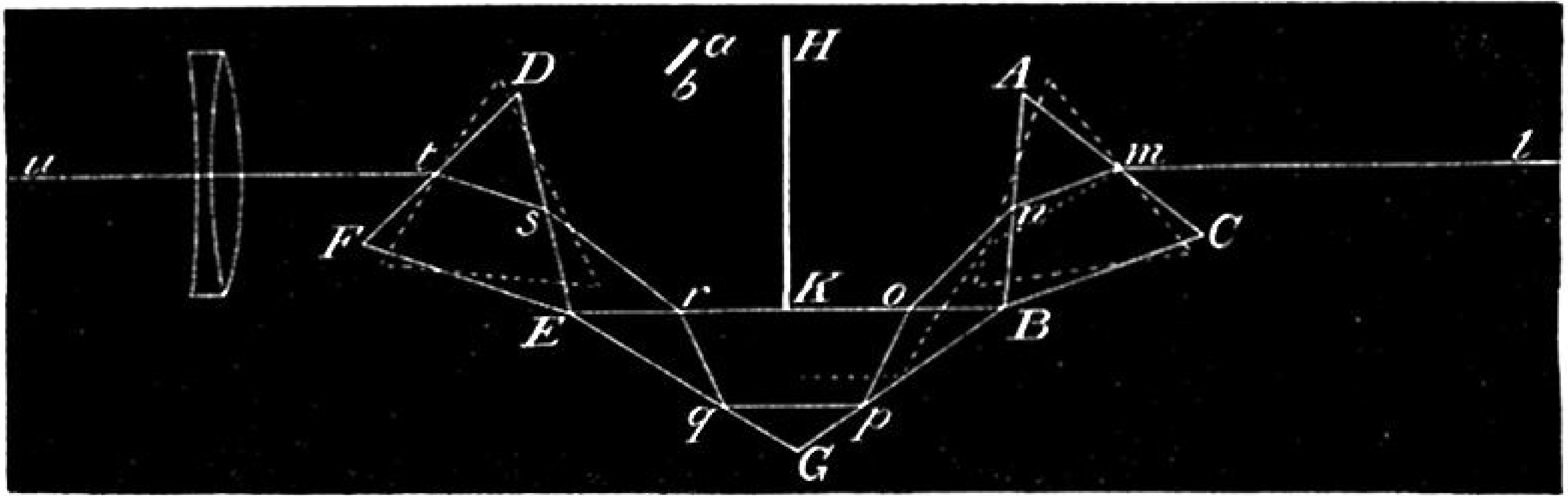
For greater convenience in manipulation, and at the same time to ensure a large angular aperture, our instrument has a short collimator and telescope. The magnification of the image is in consequence but small, but nevertheless it is easy to see the nickel line between the two D lines in the solar spectrum, and the large angular aperture makes it easier to see faint spectra from large objects, as well as to catch the light of a moving object. With an eyepiece of low power it serves well for the observation of absorption spectra.

Measurements are made with it by bringing the line of which the position is to be measured to a fixed pointer in the middle of the field of view. The whole angle through which the prisms have to be moved in passing from A to H is 10° 15′, and as it is easy to read quarter minutes with the vernier, considerable accuracy of measurement may be attained. It must be observed, however, that the change of angle is not proportional to the change of refrangibility of the rays brought to mid-field, because a larger proportional rotation is required at the violet end, when the prisms are near the position of minimum deviation, than at the red end. Still there is a rotation of 33′ 30″ in passing from A to B.

The prisms are enclosed in a box, and though this is an advantage in viewing faint spectra, it would sometimes be difficult to see the pointer without some means of illuminating either the pointer or the field. We effect the latter object by a slit in the side of the box, and a small white paper reflector, *ab* in the figure, which throws light from the opening in the box on to the side of the object glass, clear of the prism. The slit in the box may be closed with a shutter or with glasses of different colours.

Lastly, the instrument can be used either with or without a stand. Without the stand it is light enough to be held in the hand and directed to the sky or to a moving object.

It has been constructed for us by Mr. Hilger with his usual skill.



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